

Claims

What is claimed is:

- 5           1.       Means for producing and/or treating alcohol-containing beverages,  
especially wine or sparkling wine,

consisting of microcapsules, each comprising at least one covering  
membrane that completely encloses the inner part of the capsule,  
10       whereby the inner part of the capsule includes cells of at least one  
species of microorganisms and/or one or more enzymes, and

whereby the covering membrane is not permeable to the cells or  
enzymes enclosed in the inner part of the capsule, and

15       whereby the covering membrane is permeable to the educts to be  
converted by the cells or enzymes and to at least one part of the  
products converted by the cells or enzymes,

20       characterized in that

the covering membrane has at least two layers radially arranged above  
one another, whereby each layer completely encloses all of the layers  
radially arranged below it.

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2.       Means according to claim 1, characterized in that at least two layers of  
the covering membrane consist of different substances.

30       3.       Means according to claim 1 or 2, characterized in that the cells and/or  
enzymes contained in the inner part of the microcapsule are embedded in a matrix.

4. Means according to claim 3, characterized in that the matrix shows an alginate compound of a polyvalent cation.

a 5. Means according to Claim 3 ~~or 4~~, characterized in that at least one  
5 layer of the covering membrane consists of a substance, that is different from the substance embedding the cells and/or enzymes and forming the matrix.

6. Means according to Claim 5, characterized in that the matrix in the inner part of the microcapsule is liquefied.

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7. Means according to one of the previous claims, <sup>1-2</sup>characterized in that  
the layers are bonded covalently and/or ionically with each other. <sub>1</sub>

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8. Means according to one of the previous claims, <sup>1-2</sup>characterized in that  
the covering membrane is not permeable to the active substances and/or  
microorganisms found outside the microcapsule, which impair the activity of the cells  
or enzymes contained in the inner capsule. <sub>1</sub>

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9. Means according to one of the previous claims, <sup>1-2</sup>characterized in that  
the inner part of the microcapsule contains cells of at least one species of yeast used in  
alcohol fermentation, preferably in wine production. <sub>1</sub>

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10. Means according to one of the previous claims, <sup>1-2</sup>characterized in that  
the inner part of the microcapsule contains cells of at least one species of lactic acid  
bacteria used in the biological acid breakdown process in wine treatment. <sub>1</sub>

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11. Means according to one of the previous claims, <sup>1-2</sup>characterized in that  
the inner part of the microcapsule contains one or more enzymes from the group of  
pectinases, glucanases,  $\beta$ -glucosidases, proteases, and/or glucose-fructose-isomerases. <sub>1</sub>

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a 12. Means according to one of the previous claims<sup>1-2</sup>, characterized in that the inner part of the microcapsule contains cells from at least one species of microorganisms and at least one enzyme.

5 13. Means according to claim 12, characterized in that the inner part of the microcapsule contains at least one species of yeast used in wine production as well as at least one yeast cell wall preparation and/or a glucose-fructose-isomerase.

a 14. Means according to one of the previous claims<sup>1-2</sup>, characterized in that 10 the inner part of the microcapsule contains, in addition to the cells or enzymes, at least one substance that increases the activity of the cells and/or enzymes.

a 15. Means according to one of the previous claims<sup>1-2</sup>, characterized in that at least one layer of the covering membrane is composed of at least one polymer.

15 16. Means according to claim 15, characterized in that that polymer is a polyelectrolyte complex.

17. Means according to claim 16, characterized in that the polyelectrolyte 20 complex comprises at least one polyanion from the group of polyacrylic acid, polymethacrylic acid, polyvinylsulfonic acid, polyvinylphosphonic acid, alginate acid, cellulose derivatives, especially carboxymethyl cellulose or cellulose-sulfuric acid ester, shellac or shellac components such as aleuritic acid or shellolic acid and at least one polycation from the group of polyethylenimine, polydimethyl dialylammonium, 25 chitosan, or poly-L-lysine.

a 18. Means according to claim 16 ~~or 17~~, characterized in that the polyanion or the polycation has a mean degree of polymerization of from 100 to 15,000, whereby the polycation or polyanion as a counter-ion has a mean degree of 30 polymerization of over 50,000.



19. Means according to claim 15, characterized in that the polymer is polystyrol, polymethyl methacrylate and/or natural rubber or a mixture thereof with one or more polyelectrolytic complexes.

20. Application of a means according to claims 1 through <sup>2</sup>~~19~~<sup>1</sup> for the production of beer, characterized in that the microcapsules contain cells of one or more of the yeast species used in beer production.

21. Application of a means according to claims 1 through <sup>2</sup>~~19~~<sup>1</sup> for the production of low-molecular alcohol, preferably of ethanol, characterized in that the microcapsules contain cells of one or more of the yeast species that enable high yields of alcohol production.

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